

ORGANISATION OF SCIENTIFIC WORK IN INDIA.¹

THE Board of Scientific Advice for India was established in 1903. When first created it was composed exclusively of, and still includes, the officers for the time being in administrative charge of the various scientific departments of the Government of India. The object primarily in view was to enable the heads of these departments to meet at stated intervals for the purpose of considering the programmes of work proposed to be undertaken by each during a coming season. The number of problems awaiting attention in so vast an area as our Indian Dependency has always been greater than the staffs of the combined scientific departments can ever hope to deal with at any one time. The avoidance of wasted effort is, therefore, in India more urgently essential even than at home. The degree to which interest attaches to problems that lie on the borderline where the activities of cognate departments meet is just as great in India as elsewhere. Questions relating to the soil are of paramount importance in a land in which agriculture is the fundamental industry; such questions often affect the officers of the Geological Survey as much as they do those of the Department of Agriculture. Questions relating to the constituents of an indigenous flora are often only second in importance to those concerning cultivated plants; such questions may be of equal interest to the Botanical Survey and the Forest Service. Yet other questions may be of interest to the zoologist on the one hand, to the veterinary officer, the forester, or the agriculturist on the other.

The high traditions of all branches of the public service in India are of long standing, and to the self-effacement which is so characteristic of her officers has been united a singular absence of jealous rivalry and a peculiar readiness to render mutual aid. Instances of the simultaneous and conscious undertaking by two departments of the investigation of the same problem have therefore been in India remarkably rare. This being the case, the establishment of a Board of Scientific Advice, with as one of its main objects the automatic elimination of overlapping of work, was perhaps less essential than the institution of such a body might be in certain other countries. Still, if in this respect the functions of the Indian Board have scarcely had to be exercised, the existence of such a body remains a desirable precaution, while since the Board was constituted it has proved advantageous by bringing about what it was in a manner constituted to prevent. For when some border-line problem now suggests itself for study to some one department, other departments are in a position to consider, at the outset, its bearing on their own work and interests. Two departments are now sometimes able to deal with one problem, and by simultaneous attack along different lines to secure results which neither de-

partment, working alone, might hope to attain in double the time. In connection with this aspect of its activities the Board has, to the public advantage, been strengthened by the addition of scientific men who are not necessarily at the head of Government departments.

Since its inception, this Indian Board has taken into consideration, along with programmes of future work, the progress of inquiries actually in hand and the results of investigations which have been concluded. Such inquiries are made the subject of an annual report. This report by the Board, it should be understood, is not to be taken as a substitute for or even as a *resumé* of the annual reports of the different scientific departments represented thereon. Those who desire to make themselves acquainted with the operations of the Surveyor-General, the Meteorological Reporter, the Inspectors-General of Forestry or of Agriculture, the Directors of the Geological or the Botanical Surveys, must study the official reports issued by these various officers. But the reader who has no such special object in view, yet wishes to form some estimate of the extent to which scientific studies are being systematically prosecuted and scientific results are being economically applied in India, will find in the Report of the Board of Scientific Advice succinct accounts by authorised and competent officers of these scientific activities during a given year.

The report of the Board for 1913-14, which lies before us, testifies to the variety of these activities and to the attention bestowed on investigation and research in India. Among the more generally interesting items in this particular report are an account by Mr. G. T. Walker of the equipment of the Solar Physics Laboratory at Kodaikānal; a note by Mr. H. H. Hayden on the materials available for the construction of Imperial Delhi; a report by Mr. R. C. Burton on the quantity of pitchblende available in the Singar mica mines; the record by Lieut.-Colonel G. P. Lenox-Conyngham of the completion of the Indian portion of the connection between the triangulations of Russia and India; and the more hopeful prospects with regard to the cultivation of the African plant known as *Java Indigo*, reported in a note by Mr. A. Howard of the Pusa Institute. But the whole report repays perusal, while one of its most useful features is the list of publications which accompanies each of its sections.

NOTES.

It is officially announced that Admiral of the Fleet Lord Fisher of Kilverstone has been appointed chairman of the Inventions Board which is being established to assist the Admiralty in co-ordinating and encouraging scientific effort in its relation to the requirements of the Naval Service. A further announcement will be made as to the *personnel* of the new Board and the address of its offices.

IN reply to a question asked by Sir Philip Magnus in the House of Commons on July 1, the Minister of

¹ Annual Report of the Board of Scientific Advice for India for the Year 1913-14. Pp. 175. (Calcutta: Superintendent Government Printing, India, 1915.) Price 1s. 4d.

Munitions, Mr. Lloyd George, said he was fully alive to the great importance of securing the co-operation of scientific workers, and of utilising so far as practicable the laboratories and workshops of our universities and technical schools for experiments and for making munitions of war. Replying to further questions, Mr. Lloyd George added that he hoped in a very short time to be able to do something in the nature of the work done in France by M. Albert Thomas, who was bringing officers from the Front to confer with members of the Academy of Science; and that he had within the past few days been discussing the question of establishing a central committee or bureau.

IN the House of Lords on July 2, Lord Bryce urged the Government to make every possible effort to utilise the services of scientific men, and said that a call to co-operation would be welcomed by all British chemists and engineers. Replying at the end of the debate, Earl Curzon referred to the surprise expressed that, considering the great resources of scientific ability in this country and the willingness shown by our men of science to be of service, more use had not been made of them. He fancied, he said, a great deal more advantage had been taken of these than was known generally. For instance, a committee of the Royal Society had rendered valuable aid, and the Admiralty and War Office could give a number of cases in which offers of scientific assistance had been accepted and advantage had ensued. He held out the hope that it would be possible to arrange to make still greater use of the services of men of science.

At the annual general meeting of the British Academy held on June 30, Lord Bryce, president, in the chair, the following were elected Fellows of the Academy:—Mr. H. Stuart-Jones, Director of the British School at Rome 1903-5; Sir Charles Lyall, Prof. D. S. Margoliouth, Mr. W. L. Newman, Sir James H. Ramsay, Bart., of Banff, and Prof. W. R. Scott.

AMONG the recent additions to the zoological department at South Kensington are some specimens which are surely destined to possess historical interest for posterity. They consist only of two or three examples of harvest-mice and one house-mouse, but they were caught in the trenches in northern France, in that part of the trenches, in fact, occupied by some of our Indian troops. These specimens were collected and presented to the museum by one of the officers of an Indian regiment, whose keenness for his favourite pursuit of natural history allowed him in the intervals of being heavily shelled by the enemy a little relaxation in the way of trapping and skinning any animals for the national museum in London.

THE council of the Royal Society of Edinburgh has awarded the Makdougall-Brisbane prize for the biennial period 1912-14 to Prof. C. R. Marshall, Dundee and St. Andrews, for his studies on the pharmacological action of tetra-alkyl ammonium compounds. The prize and medal were presented at the meeting of July 5. These researches of Prof. Marshall's may be described as the direct outcome of investigations

which were published in the Transactions of the Royal Society of Edinburgh by Prof. Crum Brown and Sir Thomas Fraser in 1869—more than forty-five years ago—and have been continued since by various pharmacologists, amongst others by two distinguished graduates of Edinburgh University working in collaboration, Sir Lauder Brunton and Prof. Theodore Cash, whose work was published in the Philosophical Transactions of the Royal Society in 1884.

THE council of the Salmon and Trout Association is seeking data as to the possibility of increasing the supply of fly-food in trout streams, and is inviting anglers and fishery owners to give details of cases in which the valuable water-bred flies have been increased substantially in number by any special measures such as the introduction, by the planting of eggs or larvæ, or the liberation of mature flies on the banks of a river or lake; and the improvement of a stream or lake by the cultivation of special weeds, careful removal of mud, and so on. The tabulation of specific results, with an account of the measures taken, would be of interest and value, and if sufficient information is forthcoming, it is hoped to publish it in the association's quarterly journal, the *Salmon and Trout Magazine*. Communications, addressed to the honorary secretary, Sir Wrench Towse, or to the editor of the magazine, Fishmongers' Hall, London, E.C., will be acknowledged.

THE death is announced, at seventy-seven years of age, of Mr. F. E. Kitchener, who served as Assistant Commissioner to the Royal Commission on Secondary Education, and was the author of a "Geometrical Note-Book," "Naked Eye Botany," and other works.

WE regret to record the death, at Dulwich, on June 26, of Mr. A. C. Hurtzig. Some particulars of his career are given in the *Engineer* for July 2. Mr. Hurtzig was born in September, 1853, and was educated at Ware Grammar School and at University College, London, where he was one of the earliest students in the engineering faculty. His early experience was gained on railways and harbours in Ireland. In 1888 he became chief assistant to Sir John Fowler and Sir Benjamin Baker. Sir John Fowler died in 1898, and, on the death of Sir Benjamin Baker, Mr. Hurtzig became head of the firm. He completed Sir Benjamin Baker's work for the Egyptian Government in respect of the raising of the Assuan Dam and the building of the Isna barrage, and was engineer of the Forth Bridge Railway Company to the time of his death. He was a member of the Institution of Civil Engineers, and also of the Iron and Steel Institute.

MR. C. E. P. SPAGNOLETTI, a well-known British electrical engineer, of Italian origin, who was born at Brompton in July, 1832, died at Hampstead on June 28. He was employed by the Electric Telegraph Company from 1847 until 1855, when he entered the service of the Great Western Railway as chief of their telegraphic department. He remained chief electrician and telegraph engineer of that railway company for thirty-seven years. In 1865 the London Metropolitan Rail-

way was opened and worked on the Great Western Railway system, and in the same year Mr. Spagnoletti brought out his disc-block instrument for controlling the traffic on the Metropolitan lines. He was responsible also for numerous other electrical appliances for use on railways. He became consulting engineer to the City and South London Railway in 1889. Mr. Spagnoletti was president, in 1885, of the Society of Telegraph Engineers and Electricians (now the Institution of Electrical Engineers), a member of the Institution of Civil Engineers, of the Royal Society of Arts, and of the Physical Society.

DR. ROBERT HEATH LOCK, whose untimely death was recorded in NATURE of July 1, was born in 1879. From Charterhouse he entered Gonville and Caius College as a scholar in 1899. After distinguishing himself in the Natural Sciences Tripos, he became Frank Smart student of the college, and was elected a fellow two years later. Lock took his degree at the time when the rediscovery of Mendel's work opened up new possibilities of research for the botanist. Through the influence of Bateson, these possibilities were at once recognised in Cambridge, and Lock determined to go to the tropics in order to start experimental work on Mendelian lines. He proceeded to the well-known Botanic Gardens of Peradeniya in Ceylon, and for several years was busily engaged in breeding work with maize and peas. Both these plants, especially the former, lend themselves readily to the recording of considerable numbers of observations. Lock took full advantage of this, and the extensive data he obtained—in one set of experiments with maize more than 50,000 records were made—made it clear that for certain characters, such as the white and yellow colour of maize seeds, the Mendelian rule of segregation was exhibited with remarkable accuracy. His experiments with peas confirmed his conclusions from those with maize, and he further published some interesting results on more complicated Mendelian phenomena. He returned to England in 1905, when he became curator of the herbarium at Cambridge, and did valuable work in organising the library of the botanical department. At the same time he started experiments with *Nicotiana*, of which an account afterwards appeared in the *Journal of the Royal Botanic Gardens of Peradeniya*. In 1908 he returned to Peradeniya as assistant-director. Shortly afterwards he became acting-director, in which position the demands on his time practically put a stop to his own researches, though he did much useful work in connection with the rapidly growing rubber industry. Changes in the administration of the Peradeniya Gardens brought him back to England once more, when he took up the post of inspector under the Board of Agriculture, which he held until the time of his death. Lock's work did much towards laying a sound foundation for genetic science, the results of which he helped to popularise in a clearly written little book. His record makes us regret that the cares of administrative work should have prevented his following up his earlier successes in research.

In a lecture before the British Astronomical Association on Wednesday, June 30, on recent developments in

the applications of electricity to precision clocks for observatories, Mr. F. Hope-Jones, chairman of the Wireless Society of London, spoke feelingly of the loss of the wireless time-signals in war time. Throughout the year 1913 and until early in August last, when all privately owned wireless installations were dismantled by order of the Postmaster-General, the rhythmic signals were observed every night at 11.30; and by means of the "acoustic vernier" the rate of an astronomical regulator running on test was determined in hundredths of a second. Since then the old laborious method of testing and rating has had to be reverted to, requiring months instead of days. Referring to the fight for freedom to listen to the international wireless time-service signals without taxation, and its successful issue shortly before the war, Mr. Hope-Jones expressed the hope that these privileges would be restored in their entirety on declaration of peace. When that day arrived, it might be necessary for the scientific world to act in concert and present this claim with unanimity and force.

THE Scripps Institution at La Jolla, near San Diego, California, is, says *Science*, to have its facilities improved. Miss E. B. Scripps has announced to the University of California her intention to give during the next two years 20,000*l.* for further equipment. A pier a thousand feet in length will be built, at which can lie the *Alexander Agassiz*, the sea-going vessel owned by the institution and used exclusively for its work. Additional aquarium facilities will be provided, all planned to be useful for scientific purposes, but in part to be available for public educational objects. A salt-water pumping plant and settling basin are also to be added. Quarters for scientific assistants and graduate students are also to be arranged. The Scripps Institution has a site of 177 acres, with half a mile of ocean frontage, well-equipped laboratories, residences for the scientific staff, a good working library, and excellent equipment. The land was given by the city of San Diego, while for the most part the other equipment has come by the gift of Miss Scripps, who has created also an endowment of 30,000*l.* for its work. The State of California gives to the University of California 1500*l.* per annum as a contribution towards the work of the institution, and the director, Mr. E. Ritter, and his staff give their whole time to the research work.

THE leading article in *Engineering* for July 2 is devoted to a discussion on French and German guns. An explanation has been given by M. R. Arnoux before the French Society of Civil Engineers of the cause of death produced by the bursting of French 75 mm. and other high-explosive shells. From evidence furnished by a pocket aneroid barometer which had been rendered unserviceable by the explosion close to it of a German high-explosive shell, it appears that the explosion had produced, at a distance of fewer than 3 metres, a sudden barometric depression in the room where the instrument was placed of at least 350 mm. of mercury, corresponding to a driving velocity of the air of .276 metres per second, and to a dynamic pressure of 10,360 kilograms per square metre. In the case of men sheltered behind

any kind of protection, the very sudden static depression of the surrounding atmosphere comes into play, and many are killed without signs of wounds. The explanation put forward is that the air and carbonic acid in solution in the blood are disengaged in the shape of minute gaseous bubbles as soon as the pressure decreases too suddenly from any cause. These bubbles are driven into the small arteries under the influence of the pressure exerted by the heart. If their diameter is greater than that of the small arteries, they form so many gaseous plugs, which instantaneously stop the blood circulation, and death occurs before there is time for them to dissolve back in the blood when the ambient atmospheric pressure returns to normal. The radius of action of high-explosive shells is less than the possible one of shrapnel for killing purposes, but they are more deadly than shrapnel, for in their radius of action no living being escapes, whilst the shrapnel is dangerous only when one of its balls or fragments strikes home.

THE report of the Marlborough College Natural History Society has just reached us. It contains one feature which the reports of other public schools might well follow. This is the Anthropometrical Report, giving the height, weight, and chest measurements of boys weighed during February, May, and October, 1914. This is an extremely useful piece of work, and might well be extended to include other details, such as the span of the arms, hair and eye colour, and the cephalic index. The sectional reports—zoological, botanical, and photographic—all give proof of keenness and shrewdness of observation.

A BRIEF but excellent summary of the life-history of the woodlark, by Mr. W. Farren, appears in *Wild Life* for June. The author's observations were made in the Breck district of Cambridgeshire, where this bird appears to be on the increase owing to the extension of plantations. He makes some interesting comparisons between this species and its ally, the skylark, more especially in regard to the method of feeding the young. The woodlark, it would seem, suffers an unusually high infant mortality owing to the raids of mice on the eggs and very young nestlings. Some very beautiful photographs add much to the value of this short essay.

IN connection with the article in *NATURE* of June 17 on "Jamaica as a Centre for Botanical Research in the Tropics," it is desirable that attention should be directed to the interesting descriptive account of the laboratory and garden at Cinchona, given by Prof. Duncan S. Johnson in the *Popular Science Monthly*, vol. lxxxv., No. 6, 1914, and vol. lxxxvi., No. 1, 1915. The history of Cinchona, which was established in 1869, is given, and is followed by an excellent account of the laboratory and the magnificent tropical vegetation by which it is surrounded. The articles are illustrated by numerous photographic reproductions, in which the luxuriance of the tree-fern growth in particular is well shown.

THE dire consequences of the reckless destruction of timber on the Victorian "flood-plain" are convincingly shown by Mr. J. G. O'Donohue in the *Victorian*

Naturalist for May. Barren, treeless wastes of huge extent now mark the sites of once flourishing forests. No use is made of the clearings thus made, which have become, indeed, a source of danger to the Murray River, rendering its navigation more difficult each year owing to the detritus carried into it by the storm and flood waters now that the vegetation no longer serves as a filter and to hold the soil. The observations on the animal life and the botany of the area explored make profitable reading. Among other things he comments on the ravages caused among the aborigines by smallpox. Hundreds of bodies lay buried in one of the sand-dunes he traversed, and some of them were disinterred. In the course of his stay in this region he gathered conclusive evidence disposing of the oft-repeated statement that the doe kangaroo, when hard pressed, deliberately throws her young one from her pouch. The ejection invariably and unintentionally follows on a long pursuit. The young one is "sent spinning from the pouch as the mother, by her enormous leaps, imparts to it a more or less vertical motion."

IN view of the number of deaths from anthrax that occur among those employed in the leather industry, especially in the handling of imported hides, a paper in the *Journal of Agricultural Research*, vol. iv., No. 1, on the disinfection of hides infected with anthrax spores, has more than ordinary interest. Mr. F. W. Tilley has investigated the efficiency of the Seymour-Jones and Schattenfroh methods which have been proposed during the last few years. The problem is difficult owing to the high resistance of anthrax spores and the necessity that the hides shall not be injuriously affected from the tanner's point of view. The author finds that the strength of disinfectant originally recommended by Seymour-Jones (mercuric chloride 1 in 5000 plus 1 per cent. formic acid) is not efficient, but 1 in 2500 is efficient if the hides are not subjected to a neutralising solution for a week or two after disinfection. If, however, the hides are immersed in sodium sulphide, as ordinarily used by tanners for dehairing, within three or four days of disinfection, even this higher strength is not sufficient to prevent fatal infection to guinea-pigs from disinfected material. For this reason the process is recommended only when the hides are treated at the port of shipment. The Schattenfroh method (2 per cent. hydrochloric acid plus 10 per cent. sodium chloride) proved entirely satisfactory from the bacteriological point of view, forty-eight hours' exposure proving efficient in every instance. Sevcik, however, has reported that while with thin hides the results were good, thick, heavily infected hides were found to contain spores virulent to mice even after seven days' exposure. The author nevertheless thinks that the Schattenfroh method is so far superior to other methods as to be well worth a trial as a standard process of disinfection for hides. Pieces of hide treated by both methods were found to be uninjured after passing through the usual tanning processes.

IN recent years German and Austrian anatomists have devoted much attention to the possibility of reconstructing the likeness of a person when merely

the bones of the head and face remain to serve them as a guide. The matter has also been taken up by anatomists in America. Recently Prof. Charles W. M. Poynter, of the University of Nebraska, handed three human skulls to an artist with the request that the soft parts of the face and head might be reconstructed according to the data published by Prof. von Eggeling, of the University of Jena. The artist did not know that the three skulls belonged to natives of North America, one being a skull found in a Nebraska loess mound by Mr. Robert F. Gilder, and possibly of Pleistocene age, another belonged to an Indian of pre-Columbian date, while the third was that of a modern Indian. Photographs of the plastic reconstructions made by the artist have been published in the illustrated Press of America, the American-Indian type of countenance being very apparent in all three. Whatever the age of the Nebraska loess skull may prove to be, there can be no doubt, from its osteological characters, that its owner was a man of the Indian type. The plastic reconstructions show that the artist had come unconsciously to the same conclusion.

THE appointment of Dr. R. E. Fries to the directorship of the Bergielund Botanic Garden is recorded in *Kew Bulletin* No. 4. Dr. Fries, who has travelled widely in South America and published extensively in various domains of botany, carries on the botanical traditions of his father, Prof. T. M. Fries, and his grandfather, E. M. Fries, the brilliant expositor of the Fungi. The Bergielund garden is at Albano, near Stockholm, and was bequeathed to the Royal Academy of Science by Bergius, the pupil of Linnæus, well known for his work on Cape plants. His bequest, in addition to the garden of 17 acres, comprised his extensive library and herbarium as well as much of his estate.

MISS MAUD D. HAVILAND records some very interesting observations, which have the additional merit of being for the most part new, on the courtship of the lapwing in the *Zoologist* for June. Under the term "courtship" she includes all behaviour that is peculiar to the bird in spring time, but the only emotional display, she contends, which is to be interpreted as a deliberate display to a prospective mate, is the exhibition of the richly coloured chestnut under tail-coverts. Miss Haviland confirms the view that the amatory exercises of these birds take place within a circumscribed area, more or less distant from the nesting place. While making no claim to originality for her interpretation of the origin of nest-building, she makes some trenchant criticisms on certain grotesque theories which have been propounded on this subject.

THE recently issued number (tome xiv., 1914) of the *Bulletin du Jardin Impérial Botanique de Pierre le Grand* contains several interesting papers in Russian, which, fortunately, are provided with summaries in French. Mlle. Ljabitzkaja contributes an account illustrated with excellent plates dealing with the various forms of *Leucobryum glaucum*, the moss which occurs in the form of free, rounded, disc-like masses with radially arranged stems sometimes met

with in Eng. and. A map of the distribution of the various forms in Russia is also included. The author considers that only the single species, *L. glaucum*, occurs in Europe, the ball-like form being var. *subsecundum*. The moss, except in the west of the Caucasus, is always infertile, and the author considers the fertile form of the Czemomorsk region to be a new variety, which he calls var. *gracile*.

IN continuation of the series of researches on the development of minerals from igneous magmas, which we owe to workers in the United States, Mr. Olaf Andersen has examined the supposed binary system, $\text{CaAl}_2\text{Si}_2\text{O}_6$ — MgSiO_3 (*American Journal of Science*, vol. xxxix., p. 408). The MgSiO_3 constituent proved to be unstable at its melting point, breaking up into forsterite and a melt. Silica appeared as cristobalite and tridymite. In certain mixtures, moreover, spinel arose, deriving its alumina from the anorthite molecule, which also became unstable. Spinel is in consequence regarded as originating in igneous rocks from a homogeneous magma. The crystallisation of forsterite under the conditions of the experiments is interestingly shown to explain the known relations between olivine and pyroxene in igneous rocks.

THE Geological Survey of Great Britain, since our notice at the end of April (*NATURE*, vol. xcv., p. 242), has issued a memoir to Sheet 269, price 2s. 6d., on the country around Windsor and Chertsey. The authors, Messrs. Dewey and Bromehead, show how the commanding site chosen for Windsor Castle is due to the erosion of an anticline of chalk, which here rises from beneath the level Cainozoic beds. It will be new to many readers that the Ditrupa sandstones in the London Clay are capable of forming waterfalls in the local streams. The sequence of flint implements in the gravel-terraces is discussed. The Scottish Branch gives us a memoir to Sheet 74, on the difficult country of Mid-Strathspey and Strathearn (price 2s. 6d.). The great alluvial cones and terraces connected with overflow-channels of glacial days are finely illustrated. The book is one that will add greatly to the pleasure of any intelligent visitor to Aviemore and the historic Grampian road.

THE severe thunderstorm which passed over the central parts of London on the evening of May 6 is dealt with in *Symons's Meteorological Magazine*. A map is given which shows very clearly the limited area over which the rainfall was heavy. Only four rainfall records have been received from the six square miles which embrace the region with a rainfall of more than 1.5 in. The measurements are 1.70 in. at Messrs. Negretti and Zambra's premises at Holborn Viaduct; 1.76 in. at Mr. Steward's in the Strand; 3.00 in. at the Holborn Borough Stone Yard; and 3.12 in. at New River Head, the office of the Northern District of the Metropolitan Water Board. It is stated that more than 3 in. of rain possibly fell on an area, about half a mile wide and a mile and a half long, between the City and King's Cross. Mr. J. M. Wood, Engineer for the Northern District of the Metropolitan Water Board, made the following careful and interesting report. "On Thursday evening, the 6th instant,

I recorded 3.12 in. of rain between 8.30 p.m. and 10 p.m., due to the thunderstorm. There can be no doubt about the time and quantity, as I had the rain-gauge checked by tanks and trucks which stood close by."

A SCIENTIFIC paper recently issued by the Bureau of Standards deals with the emissivities of metals and oxides at temperatures near their melting points. The work is by Messrs. G. K. Burgess and R. G. Waltenberg, who use throughout the micropyrometer invented by the former three years ago. A speck of the substance weighing about a hundredth of a milligram is placed on a platinum strip which can be heated in an atmosphere of air, hydrogen, or other gas until the substance melts. On cooling it presents a smooth, clean surface. The carbon or tungsten filament of the micropyrometer is then brought alternately to the same brightness as the bare and as the covered platinum when viewed through coloured glasses. The emissivity of platinum being known for all the temperatures used, the temperatures and emissivities of the substances can be calculated. For the wavelengths at which the comparisons are made the metals do not appear to change their emissivities much in the 20° C. below their melting points, but some of them and some of their oxides show a marked increase of emissivity on melting. This increase of emissivity on melting in the case of platinum makes the Violle unit of light uncertain.

THE Economic Proceedings of the Royal Dublin Society (vol. ii., No. 10, p. 161) contains an account by Prof. G. T. Morgan and Mr. G. E. Scharff of preliminary experiments on the utilisation of peat tar. The tar produced by distilling peat in retorts, producer gas plants, or other suitable distilling apparatus, yields certain neutral oils which differ from the aromatic oils of coal tar and from the paraffins in having a highly unsaturated character manifested by the rapid absorption of atmospheric oxygen. The alkaline extraction of these oils leads to the separation of acidic oils of high boiling point and of great germicidal power. The higher fractions of the neutral oils yield waxes resembling the Montana wax of lignite. The crude peat tar oil contains small amounts of basic substances of the pyridine group, whilst the residue of the distillation is a typical soft pitch.

AN interesting paper on a greatly improved hæmin test for blood is published by Dr. William Beam and Mr. Gilbert A. Freak in the *Biochemical Journal* (vol. ix., p. 161). The difficulties experienced with Teichmann's test when applied to stains, both fresh and old, are due chiefly to the too rapid evaporation of the solvent, and, to a less extent, to interference of the albuminous matter of the blood with the crystallisation. Evaporation should be extremely slow, and when carried out in the manner detailed in the original paper, which also eliminates the harmful effect of albumin, crystals are obtained with the greatest certainty and of remarkably large size, even though only a minute amount of blood be present. The test as described was found to be equally applicable to bloodstains, fresh or even twelve years old, stains

partially removed by soap and water or heated to 110°, or mixed with earth, or to old stains on rusty iron which had been exposed to strong sunlight and atmospheric conditions during several days. Of the reagents which have been recommended for Teichmann's test, acetic acid is by far the best. It suffices for the test with bloodstains which have not been extracted with water, but as a precautionary measure it is best to use a reagent containing a minute proportion—about 0.01 per cent.—of sodium chloride.

THE Journal of the Society of Chemical Industry (vol. xxxiv., No. 10, May 31) contains an account by Dr. E. Howard Tripp of a novel system of sewage treatment, called the Dickson centrifuge process. The Dickson method of separating the solids from sludge consists in treating it with 0.5 per cent. of yeast for twenty-four hours at 33° C. Owing to the escape of gases set free by anaerobic fermentation, the solids rise to the surface, from which they are run off; in this manner fully half the water-content of the sludge is eliminated. Live brewer's yeast is the most effective agent, but dextrose, starch, and other substances which act as nutrients to the bacteria, produce the same result. The separated sludge is then completely dried by exposure to hot air in a plant which resembles that used in France for drying pulverised coal-dust. The dried material contains 3 per cent. of nitrogen and 50 per cent. of organic matter, and has proved itself to be a valuable fertiliser, either alone or as a base for artificials. The centrifuge treatment of effluents of all kinds consists in passing them through a centrifugal machine the perimeter of which is perforated and covered with a layer of sand. In its passage through the interstices of the sand, a bad effluent is completely oxidised and becomes super-saturated with oxygen; if it be further treated in a small contact bed and again centrifuged, the purification, both chemical and bacteriological, appears to be complete. The city analyst of Winnipeg found that the reduction of bacteria in a sewage effluent was from 8,150,000 to 1,150,000 per c.c., and that the *B. coli* were completely eliminated.

A PROBLEM which is perpetually presenting itself in chemical work is to distinguish "mere" polymorphism from the more labile types of isomerism and polymerism. Perhaps the most conspicuous illustration is that of ice, which exists in several dense, as well as in one or more light, modifications; it is suspected that all the dense modifications may be polymorphous forms of dihydrol, H_4O_2 , and that all the modifications which are lighter than water may be polymorphous forms of trihydrol, H_6O_3 ; but it is not easy to prove whether this view is correct or not. In the case of certain optically-active substances, such as the two varieties of glucose, conclusive evidence of isomerism or polymerism is found in the fact that freshly prepared solutions of the two forms exhibit unequal rotatory powers, gradually converging to a common value as a condition of equilibrium is attained; if the difference had consisted merely in the dissimilar marshalling of identical molecules in the crystals, every point of contrast would have disappeared instantly on dissolution or fusion. Unfor-

tunately optical activity is an exceptional attribute, and a method depending on solubility which has been described recently by Mr. N. V. Sidgwick, in the *Journal of the Chemical Society* (vol. cvii., p. 672), promises to become applicable on a somewhat wider scale. The isomerism of the two forms of benzoyl-camphor has been confirmed by the new method, and similar phenomena have been detected in two additional cases. Negative results indicate that in other cases the modifications may be due to polymorphism, but this conclusion can only be tentative, as identical results would be produced by rapid isomeric or polymeric changes.

OUR ASTRONOMICAL COLUMN.

THE METEOR SEASON.—Mr. Denning writes:—"There is a special season for many things, and meteors have their more favourable times and periods. Astronomers generally regard the months of August and November as the particular dates when meteors are abundantly displayed. There is substantial ground for this idea. August and November are memorable as having been the months of occasional brilliant exhibitions of meteors in the modern past. In more ancient times July and October were the favoured months by the same meteoric systems, which have slowly advanced in their dates owing to changes in astronomical conditions. To the regular observer the meteoric season may be said to open at about the middle of July, when there occurs a decided increase in the visible number of meteors contemporary with the first oncoming of the Great Perseid shower. We may usually observe twice as many meteors during the last half of July as in the first half. This is not wholly due to the activity of two or three special showers, but is partly attributable to a general increase in meteoric phenomena. July often affords a most agreeable recompense to the observer in supplying plenty of interesting objects, and this is always appreciated after their rarity in preceding months. Thus in June, 1915, at Bristol, only thirty-six meteors were seen in watches of the sky extending over 20½ hours, a degree of scarcity which I never remember to have previously experienced. The Perseids ought to be splendidly witnessed this year with suitable weather about August 9-13. The path of the larger meteors should be carefully recorded, also the time when the maximum number of meteors is visible."

DISPLACEMENTS OF ENHANCED IRON LINES AT CENTRE OF THE SUN'S DISC.—The general displacement of the solar lines towards the red has been interpreted at the Kodaikanal Observatory as due to movements of the solar gases in the line of sight and not to pressure; the movement is one of recession from the earth or a falling movement at the centre of the sun's disc. Thus a circulation of the solar gases is suggested, the cooler gases falling and being replaced by the hotter gases ascending from below; such a circulation might account for the relatively great intensity of the enhanced lines of iron and other substances in eclipse spectra as compared with their intensities in the Fraunhofer spectrum. With a view to detect the rising movement of the hotter gases, Dr. Evershed and Naragana Ayyar (Kodaikanal Observatory Bulletin 46) have made a special study of the enhanced lines of iron in the sun and in the electric arc, the results of which they now publish. Details are given as to the spectrograph employed, method of producing the enhanced lines, times of exposure, etc., and a table is published showing the shifts of enhanced lines at

the centre of the sun's disc. The list gives the results for sixteen lines which are of sufficient intensity for accurate measurement, and in every case except one these enhanced lines give positive shifts, showing that they cannot represent ascending gases as was supposed. Investigating the possibility of any relative shift between the enhanced and ordinary lines they find that there is none. Then they conclude "that the enhanced lines of iron in the sun give therefore no evidence of a radial circulation of the solar gases nor of any relative movement compared with the arc lines."

THE MAXIMUM BRIGHTNESS OF VENUS.—M. Henry Rey describes in the June number of *L'Astronomie* some measures that he made with M. Comas Sola on the comparative brightness of Venus and Sirius. Taking advantage of a particularly clear evening at Barcelona on March 25 in 1913, when the planet Venus was at her period of maximum brightness, they secured a series of photographs of the planet and Sirius (out of focus) on the same photographic plate. In the case of the latter the size of the image was so adjusted as to be equal to that of the planet. The durations of the exposures were 2, 4, 6, 8, and 10 seconds for the planet, and 25 seconds 1, 2, 3, 4, 5 minutes for the star. A comparison of the discs led to the conclusion that 10 seconds on Venus equalled two minutes on Sirius, or that Venus was twelve times brighter than Sirius. Thus the magnitude of Venus would be 6.72, Sirius being -1.4. Another communication on the same subject, by M. Salvador Raurich, appears in the same journal, and gives the brightness of Venus as nine times that of Sirius, nineteen to twenty times that of Aldebaran, and five times that of Jupiter.

CAUSES OF CHANGES IN THE RATE OF A WATCH.—There are no doubt many amateur astronomers who depend for their time on watches, and now that wireless time-signals cannot be received, they have to trust to their rates for longer periods than was then necessary. When such watches are taken out of the pocket and hung up or placed on a rest for the night the change in the rate is liable to many vicissitudes. Such variations can amount to a considerable quantity, and an interesting note on this subject appears in the May number of the *Monthly Notices of the Royal Astronomical Society*, by Mr. J. J. Shaw. In his concluding remarks the author states that "since writing the foregoing, it has been brought to my knowledge that the late Lord Kelvin made some similar experiments with watches," particulars of which were given in his "Popular Lectures," vol. ii., p. 360. The subject is, nevertheless, of such practical importance that attention may be directed to Mr. Shaw's communication. The chief moral to be drawn is, do not hang your watch up on a hook or nail unless precautions are taken to prevent the watch from oscillating. If you do, then an oscillation may be set up, under the influence of the watch's own balance-wheel, which will change the rate from a fraction of a second a day to one of many seconds or even to a quarter or more of a minute.

THE BRITISH SCIENCE GUILD.

THE ninth annual meeting of the British Science Guild was held on Thursday, July 1, the chair being taken by the president, the Right Hon. Sir William Mather. In opening the proceedings, the president expressed regret that owing to weak health Sir Norman Lockyer, chairman of the Executive Committee, and the founder of the guild, was unable to be present. Referring to the presidential address to the